

## **CIRCUIT BOARD CARD GUIDE AND LOCK**

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### **FIELD OF THE INVENTION**

This invention relates to fasteners, and more particularly to computer cabinet fasteners for printed circuit boards.

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### **BACKGROUND OF THE INVENTION**

In many complex systems, such as aircraft, many computer functions are performed by modular printed circuit boards (PCBs) located within a chassis, such as an Aerospace Environment Support Unit (AESU) or a Communication Management Unit (CMU). The chassis allows operators and maintenance personnel to efficiently stack multiple printed 20 circuit boards. The chassis are light weight and made of a flimsy metal and thus are not very rigid devices. The PCBs inserted within the chassis are stiff, thus requiring some sort of guide and lock to secure the printed circuit board within the chassis. Because of the difference between the rigidity of the printed circuit boards and the chassis, electrical and mechanical connections between the PCBs and the chassis can be compromised in a 25 vibrating environment such as an aircraft where extended periods of vibration occur.

Certain PCB track systems have been developed in order to securely hold the PCB within a chassis. One such device uses a track that includes multiple spring-loaded parts. A PCB stacked in this device is difficult to release because of the direction and location of the springs-loaded parts, thus, increased maintenance time and costs occur. Also, because these 5 devices do not apply pressure to an entire edge of a printed circuit board, these devices may disconnect from electrical connections during moderate periods of vibration.

Therefore, there exists a need for securing printed circuit boards within a chassis during long periods of vibration and allowing a user to easily remove the printed circuit board from the chassis. There is also a need to lock a PCB securely in a stable or rigid chassis 10 to preclude vertical excursion under vibration that may destroy connectors used at the ends of the boards for electrical and/or signal transmission.

#### **SUMMARY OF THE INVENTION**

The present invention provides a printed circuit board chassis device for securely holding printed circuit boards (PCB) while allowing for easy insertion and extraction. In one 15 embodiment the device includes four walls orthogonally connected and at least two circuit board securing devices coupled to two of the four walls, wherein the two walls oppose each other. The securing devices include a base section and a securing member. The base section is attached to a respective wall. The base section includes a groove formed by a first and second wall. A first component moves the securing element at a first end longitudinally 20 within the groove of the base section. A second component keeps a second end of the securing element within the groove of the base section. Force-producing devices move the securing element closer to the first wall of the base section as the first component is adjusted.

In one aspect of the invention, the first component includes a screw received through a slot in the base section and into a threaded cavity of the securing member.

25 In another aspect of the invention, the second component includes a set screw received through a threaded cavity of the base section and a slot of the securing member.



In still another aspect of the invention, the securing member includes one or more lateral support devices.

In yet another aspect of the invention, the force-producing devices include ramps located on the base section and the securing member.

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#### **BRIEF DESCRIPTION OF THE DRAWINGS**

The preferred and alternative embodiments of the present invention are described in detail below with reference to the following drawings.

FIGURE 1 illustrates a perspective view of a chassis that holds printed circuit boards and includes securing devices formed in accordance with the present invention;

10 FIGURES 2 and 3 illustrates exploded views of an example securing device formed in accordance with an embodiment of the present invention; and

FIGURE 4 illustrates an alternate embodiment of the present invention.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

FIGURE 1 illustrates a perspective view of an example printed circuit board (PCB) 15 chassis 20 that securely receives PCBs and allows the PCBs to connect to corresponding electrical buses. Mounted to an interior base and top of the chassis 20 are securing devices 24. The securing devices 24 are described in more detail below with regards to FIGURES 2-4. Although a rectangular chassis is shown, various geometrically shaped chassis may be used.

20 FIGURE 2 is a perspective exploded view of an embodiment of a securing device 28. The securing device 28 includes a base section 30 and a securing member 32. The base section 30 includes a lengthwise groove that is formed by a first wall 40 and a second wall 42. The base of the groove includes one or more fastener holes 46 that receives a rivet, screw, or other type of securing device for mounting the base section 30 to the chassis 20. 25 The second wall 42 includes a first end wall 50 that includes a slot 52.

An interior wall of the second wall 42 includes one or more ramps 66. The securing member 32 includes one or more ramps 70 that are oppositely opposed to the respective ramps 66. When the securing member 32 is placed in the groove between the first and second walls 40 and 42 of the base section 30, the ramps 70 and 66 face each other. A fastener, such as 5 a screw 74, a toggle, or other mechanism that allows multiple longitudinal positions of the securing member 32 relative to the base section 30, passes through the slot 52 and is secured into a receiving cavity 78 at a first end of the securing member 32. As the screw 74 is tightened into the cavity 78, the securing member 32 moves toward the first end wall 50 of the base section 30 and the ramps 70 and 66 come in contact, thus moving the securing 10 member 32 closer to the first wall 40. The slot 52 allows the screw 74 to slide laterally as the ramps 70 and 66 force the securing member 32 towards the first wall 40.

The first wall 40 also includes a second end wall 56 that includes a cavity 58 that is approximately perpendicular to the longitudinal axis of the base section 30. The cavity 58 receives a set screw 60. The set screw 60 is received at a second end of the securing 15 member 32 in a cavity 80, thus keeping the securing member 32 within the groove of the base section 30. The cavity 80 allows movement of the securing member 32 along the longitudinal axis of the base section 30.

Before the screw 74 is tightened, a printed circuit board is slid into the groove formed between the first wall 40 and the securing member 32. As the screw 74 is tightened, the 20 securing member 32 moves towards the first end wall 50 of the base section 30, thus putting pressure along the length of the end of the printed circuit board that is received within that slot.

The first and second walls 40 and 42 of the base section 30 are beveled at the first end wall 50 and the first end for directing travel of a PCB into the groove.

25 In one embodiment, the securing member 32 is a monolithic material.

FIGURE 3 illustrates a securing device 90 similar to the securing device 28 shown in FIGURE 2 except that a PCB groove formed between a securing member 92 and a base section 94 is on the opposite side of the securing device 90.

As shown in FIGURE 4, an alternate embodiment of the present invention includes 5 one or more support flanges 100 that are located on the securing member 32 on the same side as the ramp 70. The flanges 100 provide lateral support or stiffeners for the securing member 32.

While the preferred embodiment of the invention has been illustrated and described, as noted above, many changes can be made without departing from the spirit and scope of the 10 invention. Accordingly, the scope of the invention is not limited by the disclosure of the preferred embodiment. Instead, the invention should be determined entirely by reference to the claims that follow.